BlueFors
CRYOGENICS

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BlueFors Cryogen-Free Dilution Refrigerator System Pre-Installation Guide v2.0

1. Required Connections

Cooling water connections:

- See Appendix A for Cryomech compressor water-flow requirements.
- Provided fittings are 12mm (1/2”) hose-barbs on both PT-compressor and GHS (see pictures 1 and 2 below).
- The flow direction is marked on the PT-compressor (water in/out) and also on the GHS connections.
- If ‘hard’ (none hose-clamp) connections are required, the hose-barbs can be removed. The fittings on the PT compressor are 3/8” FPT (US), and on the GHS R1/4 female.
- The bulk part of cooling water flow should go through the PT compressor. Cooling water should not be connected in ‘series’ through compressor and GHS, as the GHS has a much higher impedance. Instead the cooling water should be supplied in parallel (see Diagram 1).
- Typical measured cooling water flow rates at BlueFors when supplying the water at **3.5 bar** are: **15 LPM for the PT compressor and 2 LPM for the GHS.**

Picture 1: ½" barbs PT

Picture 2: ½" barbs GHS

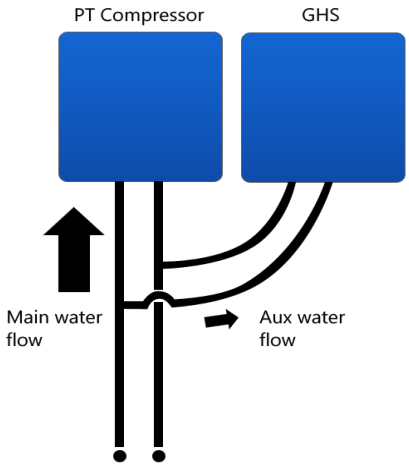


Diagram 1: Water flow

Power outlets:

- 3 - phase for PT compressor (see Appendix A). No plug provided for US/Asian systems.
- Single-phase for GHS (max current 16A for 200 Vac systems or 20 A for 100 Vac systems). No plug provided for US/Asian systems.
- Single-phase for control-cabinet and resistance bridge.
- Single-phase for magnet power supply (nominal 230 Vac, max current 9.5 A for one supply) and controller. Cables are rated for high current.[1]

[1] Systems with magnet only.

Compressed air supply for control cabinet:

- Provided fitting is a quick-disconnect with 8mm (~5/16”) hose-barb, see pic. 3.
- Quick-disconnect fits female serie-25-type, see picture 4.
- If a ‘hard’ connection is preferred, the quick-disconnect fitting can be removed. The thread on the feedthrough fitting is G1/4 female.
- Minimum 5 bar (70psi) pressure required.

Picture 3: 8mm barb

Picture 4: serie-25 quick fit

Computer:

- Windows computer that supports LabView runtime (see Appendix B).

2. Shipping Crates

Crates should be carefully inspected on arrival for any damage. Also all the Tip-N-Tell and shock sensors should be checked. If there is any indication of damage or misuse during shipment, the delivery should NOT be accepted and BlueFors should be contacted immediately.

Note: BlueFors cannot be held responsible in case a damaged shipment has been accepted by the customer.

- All crates can be moved around with a standard pallet jack.
- **All crates must be unpacked by removing the top-panel first** (in order to see how items are packed inside).
- At least one of the side-panels is closed with only screws (no nails) for easy opening.

The cryostat itself should remain stored in the shipping crate until final installation into the frame. The cryostat has a very high center of mass and is not safe standing freely on the floor!!

Typical packing crate dimensions for standard systems are (length x width x height in cm):

NO	CONTENTS	DIMENSIONS	WEIGHT
Box 1	Cryostat and PT compressor	170 x 100 x 210 cm^3 (XLD) 130 x 90 x 210 cm^3 (LD)	690 kg 400 kg
Box 2	Gas Handling System	115 x 90 x 230 cm^3 (XLD/LD400) 115 x 90 x 210 cm^3 (XLD/LD250)	475 kg 450 kg
Box 3	Control Unit and Resistance bridge	115 x 90 x 200 cm^3	225 kg
Box 4	Frame and misc	245 x 170 x 105 cm^3 (XLD) 245 x 130 x 70 cm^3 (LD)	600 kg 450 kg

Typical component weights and dimensions are (length x width x height in cm):

	DIMENSIONS	WEIGHT
GHS	90 x 75 x 215 cm^3 (XLD/LD400)	350 kg
	90 x 75 x 200 cm^3 (XLD/LD250)	300 kg
Control cabinet	70 x 100 x 180 cm^3 (Big table)	70 kg
	70 x 80 x 180 cm^3 (Small table)	70 kg
Frame (not assembled)	210 x 155 x 30 cm^3 (XLD)	300 kg
	210 x 100 x 30 cm^3 (LD)	130 kg
Cryostat	200 x 90 x 90 cm^3 (XLD)	330 kg
	200 x 65 x 65 cm^3 (LD)	150 kg
Compressor	65 x 65 x 95 cm^3 (PT415)	215 kg
	70 x 50 x 70 cm^3 (PT400)	120 kg

Minimum door/elevator dimensions required for unpacked GHS/cryostat:

- **XLD400/250**: Height 215/200 cm, Width 90 cm
- **LD400/250**: Height 215/200 cm, Width 75 cm

3. Tools for Unpacking

- Electric drill with screw tool bits
- Crowbar
- Hammer
- Band cutter (heavy duty side cutters)

A **>500kg hoist** for lifting heavy items out of the crates (see picture below).

To move and install the cryostat into the frame: a stacker or high lifting pallet jack.

4. Additional Notes

- Enough space should be reserved near the compressor unit for coiling the extra length of helium-flex lines of the PT-cooler (2 lines, 20 meters total length each).

- A Helium leak detector should be available for use during the installation.

- If He-3 for mixture is provided by the customer a low pressure (~1 bar) tank with a KF16 or KF25 flange outlet connection is preferred. If the He-3 is in a high pressure container either a suitable pressure-regulator or a high-pressure rated, high-impedance connection ending in a KF16/KF25 flange is required.

  Note: He-4 part of the mixture is always provided by BlueFors Cryogenics and comes pre-filled in the mixture tanks.

Appendix A

PT410 electrical specifications

Specifications: PT410 RM with CP2880

Cold head

Total weight.....48 lb (21.8 kg)
Expander.....27 lb (12.2 kg)
Remote motor.....12 lb (5.4 kg)
Reservoir volumes.....9 lb (4.1 kg)
Dimensions.....See cold head drawing
Cool down time.....60 minutes to 4K
Lowest temperature.....2.8K with no load

Helium static pressure – all components @ 77°F (25°C)

60 Hz System.....230 ± 5 PSIG (15.9 ± .34 bar)
50 Hz System.....17.9 ± .34 bar (260 ± 5 PSIG)

Maximum sound level

Water cooled system.....70 dBA at 1 meter

Flexible lines

Standard length.....66 ft (20.1 m)
Weight (pair).....74 lb (33.6 kg)

Electrical specifications

Electrical Rating	Input Power (kW)		Maximum Current (A)	Dedicated Circuit Breaker (A)
	Maximum	Steady State		
220/230 VAC 60 Hz	9	7.2	27	40
460 VAC 60 Hz	9	7.2	13	25
200/220 VAC 50 Hz	9	7.2	27	40
380/420 VAC 50 Hz	9	7.2	16	25

Appendix A

PT410 cooling water requirement

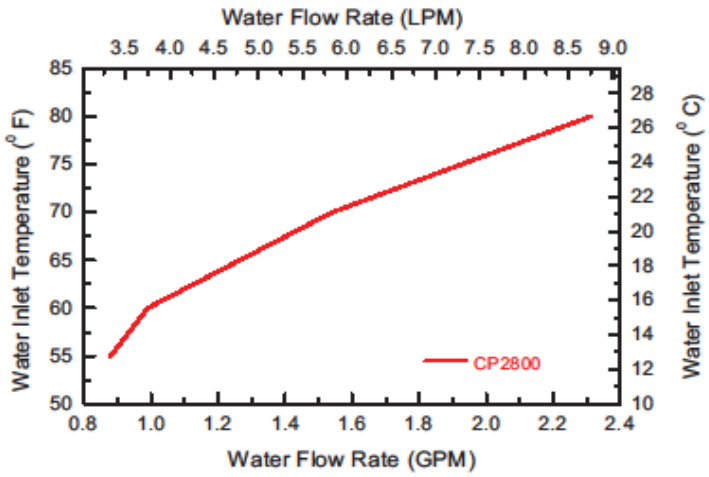


Figure 5-1: Cooling water requirement*

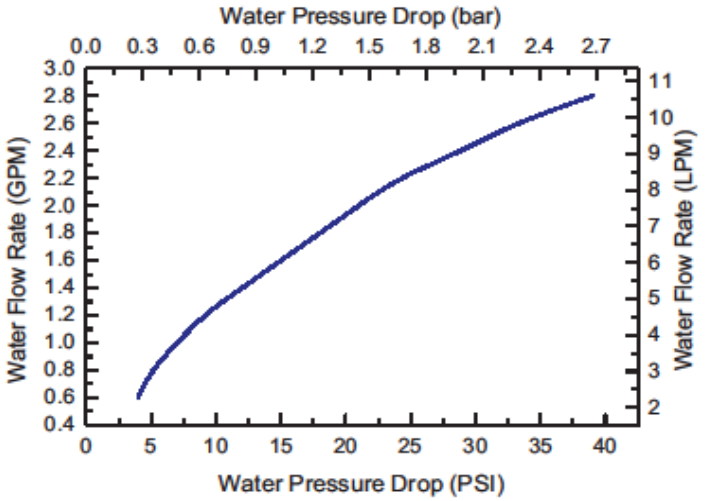


Figure 5-2: Cooling water pressure drop*

* When using a 50-50% mixture of ethylene glycol and water increase the flow rate 10%. Pressure drop values will increase 40%.

Appendix A

PT415 electrical specifications

CRYOMECH Appendix A

Specifications: PT415 RM with CP1110

Cold head

Total weight.....57 lb (25.9 kg)
Expander.....29 lb (13.2 kg)
Remote motor.....19 lb (8.6 kg)
Reservoir volumes.....9 lb (4.1 kg)
Dimensions.....See cold head drawing
Cool down time.....60 minutes to 4K
Lowest temperature.....2.8K with no load

Helium static pressure – all components @ 77°F (25°C)

60 Hz System.....220 ± 5 PSIG (15.2 ± .34 bar)
50 Hz System.....17.2 ± .34 bar (250 ± 5 PSIG)

Maximum sound level

Water cooled system.....76 dBA at 1 meter

Flexible lines

Standard length.....66 ft (20.1 m)
Weight (pair).....90lb (41 kg)

Electrical specifications

Electrical Rating	Input Power (kW)		Maximum Current (A)	Dedicated Circuit Breaker (A)
	Maximum	Steady State		
200/230 VAC 60 Hz	12.7	10.7	42	50
440/480 VAC 60 Hz	11.3	9.6	17	25
200 VAC 50 Hz	11.6	9.9	38.5	50
380/415 VAC 50 Hz	10.0	8.0	17.5	25

Appendix A

PT415 cooling water requirement

CRYOMECH Specifications

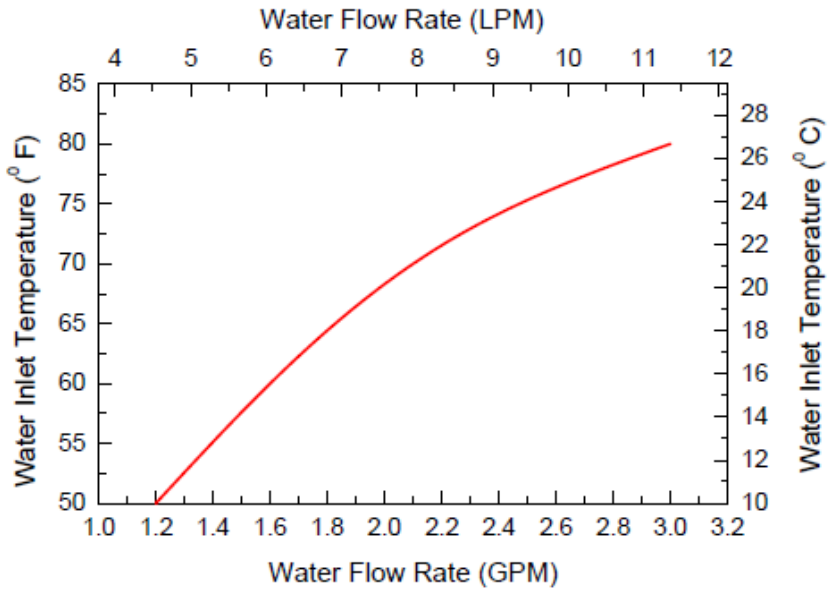


Figure 5-1: Cooling water requirement*

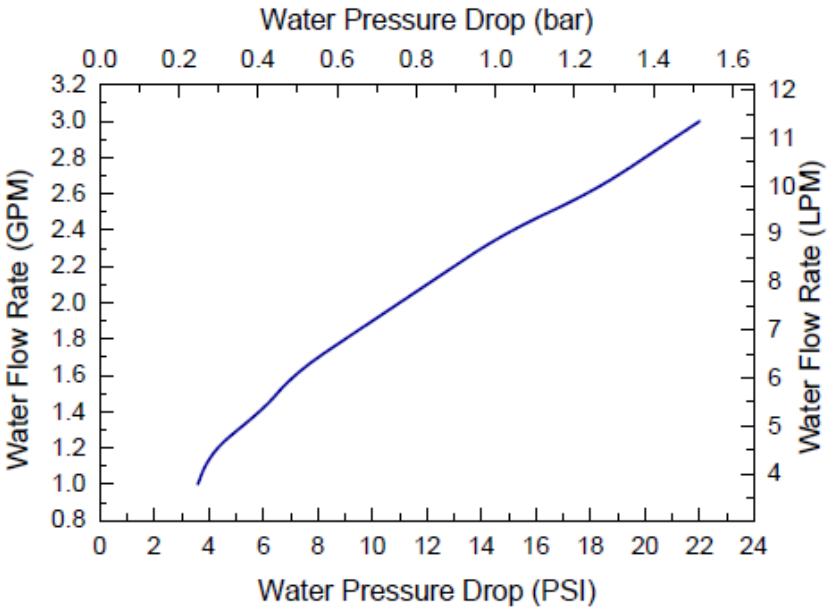


Figure 5-2: Cooling water pressure drop*

* When using a 50-50% mixture of ethylene glycol and water increase the flow rate 10%. Pressure drop values will increase 40%.

Appendix A

PT420 electrical specifications

Specifications: PT420 RM with CPA1114

Cold head

Total weight..... 57 lb (25.9 kg)
Expander..... 29 lb (13.2 kg)
Remote motor..... 19 lb (8.6 kg)
Reservoir volumes..... 9 lb (4.1 kg)
Dimensions..... See cold head drawing
Cool down time..... 60 minutes to 4K
Lowest temperature..... 2.8K with no load

Helium static pressure – all components @ 77°F (25°C)

60 Hz System..... 220 ± 5 PSIG (15.2 ± .34 bar)
50 Hz System..... 17.2 ± .34 bar (260 ± 5 PSIG)

Maximum sound level

Water cooled system..... 76 dBA at 1 meter

Flexible lines

Standard length..... 66 ft (20.1 m)
Weight (pair)..... 90lb (41 kg)

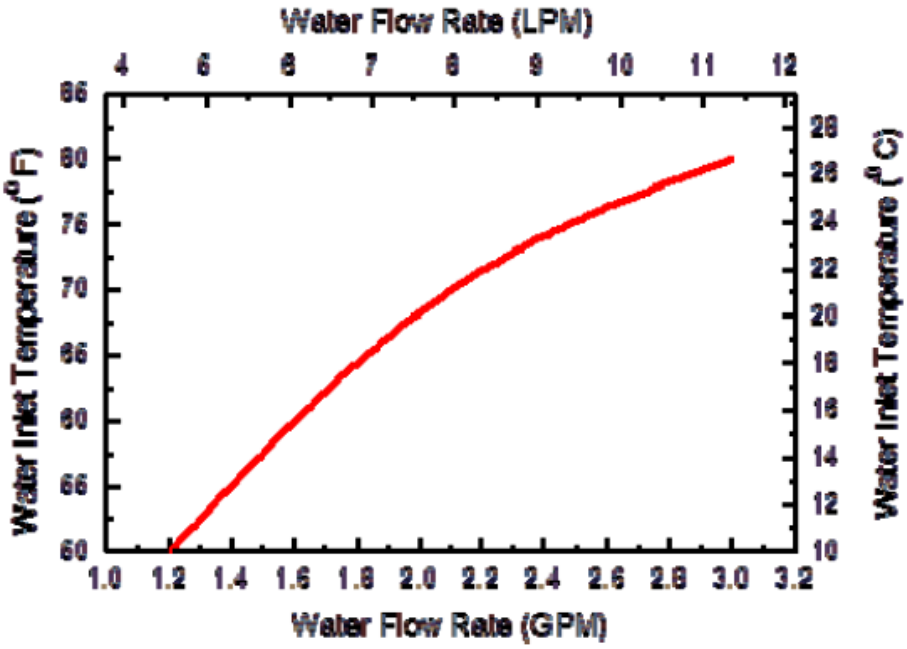
Electrical specifications

Electrical Rating	Input Power (kW)		Maximum Current (A)	Dedicated Circuit Breaker (A)
	Maximum	Steady State		
440/480 VAC 60 Hz	14.5	13.0	21	25
380/415 VAC 50 Hz	13.5	11.4	22	25

Appendix A

PT420 cooling water requirement

Figure 5-1: Cooling water requirement*



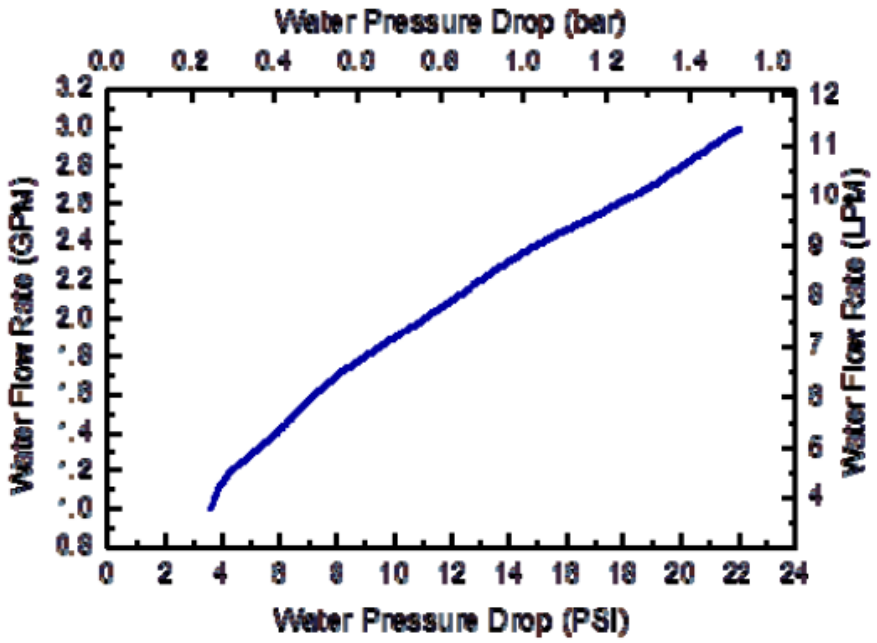


Figure 5-2: Cooling water pressure drop*

Appendix B

Computer requirements

http://www.ni.com/labview/requirements/

Windows

	Run-Time Engine
Processor	Pentium III/Celeron 866 MHz (or equivalent) or later (32-bit) Pentium 4 G1 (or equivalent) or later (64-bit)
RAM	256 MB
Screen Resolution	1024 x 768 pixels
OS	Windows 10/8.1/8/7 SP1 (32-bit and 64-bit) Windows Server 2012 R2 (64-bit) Windows Server 2008 R2 SP1 (64-bit)
Disk Space	620 MB